

Novel plume deflection concept testing

Completed Technology Project (2012 - 2016)



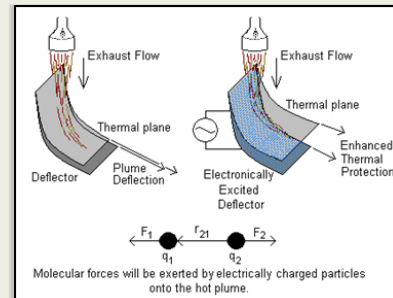
Project Introduction

The proposed effort will explore the feasibility and effectiveness of utilizing an electrically driven thermal shield for use as part of rocket plume deflectors. To accomplish this, a small scale prototype deflector cover will be designed and tested. The overall reduction in thermal conduction will then be observed using high speed thermal imaging. The goal is to achieve a ten percent reduction; however, any thermal reduction would be considered a valuable success. The fundamental principles from a small scale system could then be used to economically scaled up for deployment within full-size rocket propulsion system.

The novel plume deflection concept is an Electrically Driven Thermal Insulation (EETI) shielding apparatus applied within the plume deflector. The intent of the technology is to minimize the large amounts of coolant and its associated plumbing, nozzles, and drains required to test rocket engines. In addition, ablative materials used to protect launch structures could be reduced by using EETI, therefore decreasing vehicle impacts from ablative debris being eroded from the structure.

Anticipated Benefits

The electrically driven thermal shield could economically be scaled up for deployment within full-size rocket propulsion systems. By initially testing this system on a smaller scale, there is the potential to reduce cost and risk associated with full-scale rocket engine testing. Research will further NASA's knowledge base in the game changing technology developments involving thermal manipulation.



Electrically Charged Particles
onto the Hot Plume

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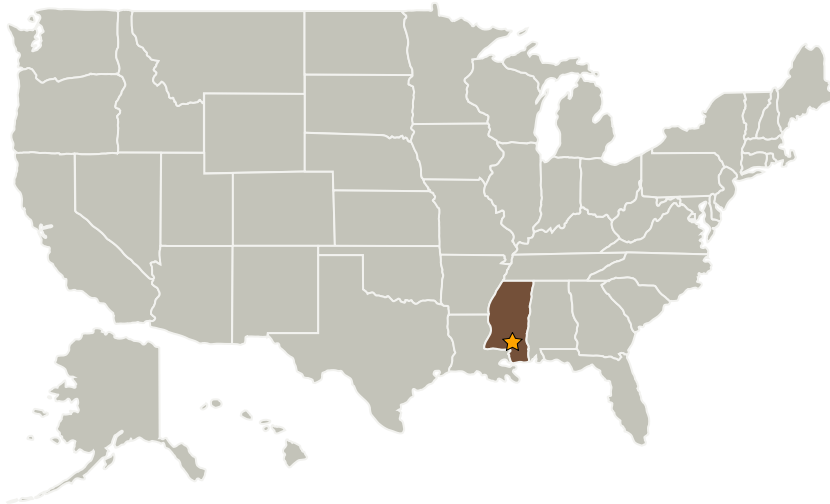
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations

Mississippi

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Center Innovation Fund: SSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Ramona E Travis

Project Manager:

Nicholas J Nugent

Principal Investigator:

Nicholas J Nugent

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Images

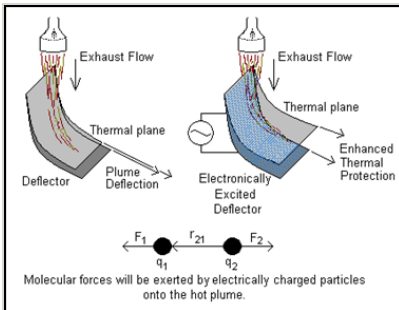


Illustration of Electrically Charged Particles onto the Hot Plume

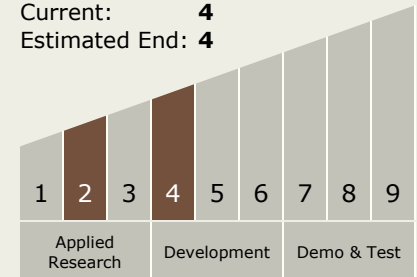
Electrically Charged Particles onto the Hot Plume
(<https://techport.nasa.gov/image/2643>)

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - TX13.2 Test and Qualification
 - TX13.2.2 Propulsion, Exhaust, and Propellant Management